Comparative Cost Of Alternative Heating Systems In Nevada County, California

The list below provides comparative costs for various alternative space heating systems in dollars per unit of heat delivered (million Btu's), in order of decreasing cost.

Because any given situation may vary from the assumptions used below, the calculations for each system type are shown so that you can adjust the cost, efficiency, or other factors to more accurately reflect your specific situation.

*** * SOON TO BE ADDED TO THIS PAGE * ***

Comparative Life Cycle Cost of Alternative Heating Systems
Compare the economics of alternatives, accounting for first cost, maintenance cost, and operating costs

Comparative Environmental Benefits of Alternative Heating Systems
Compare the environmental impacts of alternative heating systems.

Electric Resistance Forced Air System: $51.25
Heat: (0.11) $ / kWhr / (3.412) kBtu/kWhr x (1,000) kBtu / MBtu / 0.65 DistribEff = $49.60
Fan: (0.11) $ / kWhr x (0.015) kW/kBtu x (1,000) kBtu / MBtu = $1.65

Heat Pump Forced Air System: $24.80 **
(0.11) $/kWhr / (3.412) kBtu/kWhr x (1,000) kBtu/MBtu / 2 C.O.P. / 0.65 DistribEff

Low Efficiency Propane Gas Forced Air System: $22.97
Gas: (1.00) $/gal / (92,500) Btu/gal x (1,000,000) Btu/MBtu / (0.78 AFUE x 0.65 DistribEff)
Fan: (0.11) $ / kWhr x (0.015) kW/kBtu x (1,000) kBtu / MBtu = $1.65

High Efficiency Propane Gas Forced Air System: $15.78
Gas: (1.00) $/gal / (92,500) Btu/gal x (1,000,000) Btu/MBtu / (0.90 AFUE x 0.85 DistribEff)
Fan: (0.11) $ / kWhr x (0.015) kW/kBtu x (1,000) kBtu / MBtu = $1.65

Low Efficiency Natural Gas Forced Air System: $14.47
Gas: (0.65) $/therm / (100,000) Btu/therm x (1,000,000) Btu/MBtu / (0.78 AFUE x 0.65 DistribEff)
Fan: (0.11) $ / kWhr x (0.015) kW/kBtu x (1,000) kBtu / MBtu = $1.65

Pellet Stove Heating: $12.50 (does not include electrical)
(170) $/ton / (17) MBtu/Ton / (0.80 Efficiency)

High Efficiency Propane Gas Radiant Heating System: $12.07 (Water Heater)*
Gas: (1.00) $/gal / (92,500) Btu/gal x (1,000,000) Btu/MBtu / (0.85 Eff x 0.90% DistribEff) = $11.45
Pump: (0.11) $ / kWhr x (0.170) kWhr x / (30) kBtuh x (1,000) kBtu/MBtu = $0.62

Air-Tight Woodstove Heating: $10.17
(180) $/cord / (4,950) Lb/Cord / (5,500) Btu/Lb / (0.65) x (1,000,000) Btu/MBtu
Based on dry oak firewood

High Efficiency Natural Gas Forced Air System: $10.15
Gas = (0.65) $/therm / (100,000) Btu/therm x (1,000,000) Btu/MBtu / (0.90 AFUE x 0.85% DistribEff)
Fan: (0.11) $ / kWhr x (0.015) kW/kBtu x (1,000) kBtu / MBtu = $1.65

High Efficiency Natural Gas Radiant Heating System: $9.27 (Boiler)*
Gas = (0.65) $/therm / (100,000) Btu/therm x (1,000,000) Btu/MBtu / (0.90 Eff x 0.90% DistribEff) = $8.02
Pump: (0.11) $ / kWhr x (0.330) kWhr / (60) kBtuh x (1,000) kBtu/MBtu = $0.61
Combustion Air Blower: (0.11) $ / kWhr x (0.350) kWhr / (60) kBtuh x (1,000) kBtu/MBtu = $0.64

High Efficiency Natural Gas Radiant Heating System: $9.12 (Water Heater)*
Gas = (0.65) $/therm / (100,000) Btu/therm x (1,000,000) Btu/MBtu / (0.85 Eff x 0.90% DistribEff) = $8.50
Pump: (0.11) $ / kWhr x (0.170) kWhr / (30) kBtuh x (1,000) kBtu/MBtu = $0.62

* These systems also provide high efficiency water heating.

** Note: Due to poor performance at low temperatures, heat pumps are not recommended in cold climates. At temperatures below 47°F, heat pumps begin to operate on electric "strip heaters" alone; at this point it has an operating cost equal to an electric furnace.

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Last revised
5/21/99

Comments@TheEnergyGuy.com

Gas turbine plant sets standard for Europe

Replacing an old, inefficient steam heating system with gas-fired radiant heaters has created a win-win situation for a major European engineering company, reports Janet Dansie.

Alstom Power Ltd, of Lincoln, is part of the recently formed ABB Alstom Power Company and, with an 1800 strong workforce, the city's largest industrial employer. Efficiency is paramount throughout the ABB Alstom Power group and new initiatives for improving efficiency at Lincoln are subject to very close scrutiny before being approved. However, once shown to be operating satisfactorily, they may well set the standard for other sites in the group, Europe-wide.

One such initiative concerned the space heating at the 26 acre site. Traditional steam boiler plant, with its vast runs of steam pipework linking high level unit heaters, with the inevitable massive heat losses and complaints of low temperatures from staff, was an obvious target for for improvement - a view supported by the Group Energy and Environmental Advisory Unit.

In 1994, the Works Service Department embarked on an energy conservation initiative aimed mainly at replacing the centralised heating plan with direct -fired gas radiant heaters for the manufacturing and storage areas of the site. They approached Gas Fired Products (UK) Ltd, manufacturers of the Space-Ray range of radiant heaters, which designed the overall system, involving more than 220 tube, and 40 radiant plaque, radiant gas heaters. Installation began in June 1996 and the heaters came into service three months later.

All the radiant heaters are controlled by a Satchwell Building Management System.Alstom's site engineer, Ray Marshall, can monitor and adjust the heating of each individual bay throughout this large plant from his desk, via his PC. The BMS can be programmed so that each bay has its own schedule and monitors its own running costs. Furthermore, each bay can be split into zones, to cater for changing patterns of work, even through a shift. For example, if only two workers are operating in one bay, the other zones can be switched off.

Radiant heaters, sited above bay doors giving access to delivery vehicles, switch off automatically when the doors are opened, saving more energy. Conversely,when the outdoor temperature rises, the BMS programme will shut down the heating above the set point. The BMS also controls the radiant heating at two other of the company's sites in the city, via telephone lines, and the system can be further extended, if required.

"We can alter on-off switching times for the heaters and temperature setting points for the bays. The computer visual display indicates which of the heaters are on and highlights any zones in which there may be a temporary problem with temperature," Marshall explains. "We work variable shifts and the big advantage of a Space-Ray radiant system is tat at night, we only need to heat the area being worked in, whereas previously, with the old steam system with its 70 tons of pipework, we had to run all areas on site all the time."

The system maintains good temperatures, even at -10ƒC outdoors. Because of the 'instant' effect of radiant heating, any low temperatures are quickly corrected. Early pre-heating is seldom required, except possibly on a Monday morning, after a weekend shutdown during very cold weather. The new heating has achieved the economies expected. Under the old system, heating energy usage on the site was the equivalent of 20.2kWh per year. Over the first year of the new system, heating was cut to 13.8kWh, with a further reduction 12.3kWh the year following.

Quite apart from the considerable financial savings achieved by eliminatng the old boiler plant - at least £124 000 annually - gas usage was slashed by £33 000 and £55 000 in the first and second years respectively. Over a three year period, this amounted to savings in excess of £500 000 - more than the initial cost of the project, but, as Ray Marshall observes, actual overall savings are probably much greater. An additional, unquantifiable factor is undoubtedly the enhanced working conditions and increased satisfaction of the workforce.

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Q: One of our utility's customers, an autobody repair shop, wants to add heaters for worker comfort in their 32' X 48' open space building. They are considering radiant heaters (they don't want a forced air system), but are open to any new technologies they have not heard of yet. Can you recommend any brands? Can you help in positioning heaters if a plan was sent over?

A: Thanks for calling The Power Line and asking about the use of radiant heating systems for use in an auto repair shop. Per your request, I am including a list of manufacturers you can contact. These manufactures will provide you information about distributors in your area. These companies often provide the layout support that you are seeking. Heating contractors are also good sources for this. I suggest calling 4 to 5 contractors and interviewing them as to their knowledge and the number of radiant heater jobs they have done. Try to visit actual sites where they were installed.

Radiant heaters work particularly well in applications such as garages because they radiate heat (infrared) directly from the heating elements to the objects they are intended to heat, and do not heat the volumes of air between the heater and the heated objects. Infrared energy will warm the people and objects inside the repair shop without heating the air, saving a considerable amount of energy.

Infrared heaters can also be used for freeze protection by focusing the heaters on areas where freezing could cause damage. Infrared can be cycled to run only when cars are being repaired, and be locked out through thermostats to not run when outside temperatures are high enough to maintain comfort. The design of an infrared heating system for comfort control is quite subjective, depending on the degree of comfort that you wish to achieve and the size and layout of the garage. A heating contractor might be able to give you more specific recommendations for locations and sizes of heaters.

One important point to be aware of is use of control strategies for radiant systems where energy conservation is expected. Various reports suggest using conventional setback thermostats to reduce the temperature by 5 to 10 degrees during unoccupied hours. They also suggest using ceiling fans to control thermal stratification, enhancing the comfort and energy savings. Take care that thermostats are not located within the "radiant zone", so as to provide a true measure of air temperature.

Following are some infrared heater manufacturers. We do not endorse any one of these and this is only intended to provide you a starting place:

Modine Mfg. Co.
Racine, WI
(414) 636-1200

Reznor
Memphis, TN
(800) 695-1901

Roberts-Gordon, Inc.
Buffalo, NY
(800) 878-7450

Space Ray
Charlotte, N.C.
(800) 438-4936

I hope this information is useful to you. If we can provide any more information, please feel free to call. Please fill out the enclosed evaluation card so we may continue to improve our services. Once again, thanks for calling The Power Line.

Sincerely,

Scott Wolf, Powerline Engineer